INCREASING KNOWLEDGE OF FISH PROCESSING THROUGH TRAINING ON MAKING FISH-BASED CULINARY PRODUCTS

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ABSTRACT

This research aims to determine the level of knowledge about fish processing among women entrepreneurs before receiving training on fish-based culinary product making, describe the implementation of the training, measure the level of knowledge after the training, and identify changes in knowledge among women entrepreneurs in Sardonoharjo Village, Ngaglik, Sleman. This study employs a quantitative descriptive approach with a one-group pretest–posttest quasi-experimental design. The population consists of women who are culinary MSME entrepreneurs in Sardonoharjo Village, and all 118 participants were selected using a total sampling method. The research instrument was a 31-item knowledge test that had been previously validated and tested for reliability. Data were analysed using descriptive statistics, the N-gain test, and the paired sample t-test. The findings indicate that the participants' knowledge of fish processing before the training was at a moderate level, with an average pretest score of 10.38, and the lowest performance was observed in the C3 and conceptual domains. The training was delivered through a lecture method combining theoretical material about fish with practical processing activities. After the training, the participants' knowledge remained in the moderate category. Still, it improved substantially, with an average post-test score of 22.71, and the most significant increase occurred in the C2 and conceptual domains. Overall, there was a significant improvement in knowledge, reflected by an N-gain score of 0.63, indicating a moderate level of effectiveness of the fish-based culinary training program.

INTRODUCTION

Hunger and malnutrition are still problems facing the world today. The World Food Programme estimates that over 333 million people faced acute food insecurity in 2023. Based on the results of the SKI, the national average shows a stunting prevalence of 21.5% ([1]. This poses a challenge for stakeholders such as governments, scientists, and local to international organisations in terms of food security. Efforts that can be made to overcome these challenges include providing the public with adequate, easily accessible, high-quality, and sustainable

affordable animal protein. The fisheries sector has great potential to strengthen global food security. Data from the Ministry of Marine Affairs and Fisheries show that fish consumption in Indonesia reached 57.61 kg per capita in 2023 [2]. Despite this, fish consumption in DIY is among the lowest in Indonesia. According to the Regional Development Planning Agency (Bappeda) of DIY, the fish consumption rate in DIY in 2023 reached 34.92 kg/capita [3].

Fish is one of the richest sources of animal protein, rich in omega-3 fatty acids, vitamin D, and minerals. The components of fish meat are highly nutritious because they contain macronutrients and micronutrients essential for humans [4]. Insufficient protein intake can lead to nutritional disorders and stunted growth in the body. One way to meet your protein intake is by consuming fish. Factors influencing fish consumption levels in a region include income, education level, number of dependents, place of residence, and taste ([5]. An alternative solution to low fish consumption, which is due to the fish's fishy taste and smell, is to consume processed fish products [6]. Additionally, an educational approach through fish processing training can enhance community life skills to improve the quality of human resources [7].

Sleman Regency is one of the regencies in the Special Region of Yogyakarta that meets the region's fish production needs. In 2023, the production of consumption fish in Sleman Regency reached 286,865 tons. Although located far from the sea, Sleman Regency can still meet the fish needs of its area by increasing fish farming in freshwater ponds, such as in Sardonoharjo Village. Sardonoharjo Village is one of the villages located in Ngaglik District, Sleman Regency, Special Region of Yogyakarta. Its location far from the sea makes the price of saltwater fish more expensive. The most readily available alternative protein source to fish for the people of Sardonoharjo Village is freshwater fish. However, the processing options are still limited, such as fried fish, grilled fish, fish *pepes*, and fish *mangut*. To increase fish consumption, training can be conducted on processing fish into fish-based culinary products that can be easily and practically done independently by residents of Sardonoharjo Village.

One strategy to increase fish consumption is to provide training and education to fishermen, fish farmers, and SMEs [8]. Sardonoharjo Village has an advantage in the field of MSMEs, where this organisation actively conducts development activities and successfully achieved the national best Community Information Society (KIM) title for the MSME category [9]. Therefore, this research aims to enhance fish processing knowledge in Sardonoharjo Village through training on the preparation of fish-based culinary products. The results of this research are expected to improve learning and understanding of fish consumption patterns in Sardonoharjo Village, as well as generate business ideas for women entrepreneurs in the Village.

METHODS

This research employs a quantitative approach with a quasi-experimental design, utilising a one-group pretest-posttest design. This design involves a single sample group, which is considered to have no prior knowledge of fish processing. Respondents in this study participated in the training voluntarily and received a snack for their participation. The one-group pretest-post-test research design was chosen because the training was conducted for the entire sample, with the hope that everyone would receive the training material well, and their knowledge levels would increase. The training was conducted in a single 180-minute session. The material was delivered using a lecture method, accompanied by PowerPoint presentations.

In this study, the sample group was given a pretest to measure their knowledge level regarding fish processing before receiving training. After the pretest, they were then educated about the benefits and importance of consuming fish and trained in processing a set of fish-based menus. By providing fish processing materials and training, it is hoped that the sample group will increase their knowledge and skills, which will also contribute to the improvement of fish consumption patterns in the population. Therefore, a posttest was administered to measure the knowledge level of the sample group after training. After conducting a pretest and a posttest, the results of both tests were compared to see if there was a change in the respondents' knowledge levels.

Table 1. One Group Pretest-Posttest Research Design

	Pretest	*Treatment*	*Posttest*
Experimental Group	X1	Y	X2

Population and Sample

The population in this study consists of mothers who are culinary MSME entrepreneurs in Sardonoharjo Village, Ngaglik, Sleman. Based on information obtained from the Chairman of the MSME Communication Forum, the number of active female MSME entrepreneurs in the culinary field in Sardonoharjo Village is 118. This research is a population study where data is collected from all members of the population. The selection of the research sample of women entrepreneurs from micro, small, and medium enterprises (MSMEs) is because MSMEs in Sardonoharjo Village are one of the outstanding communities in the area. The Sardonoharjo Village MSME Community Forum regularly conducts training activities to enhance the knowledge and skills of its MSME members.

Table 2 shows that out of 18 hamlets, the most significant number of respondents came from Candiwinangun Hamlet (9.32%), Ngalangan (7.62%), and Candi Dukuh (7.62%). The majority of respondents are of productive age, specifically 31-50 years old (66.10%). At this age, respondents are also active on social media, allowing them to receive information about fish processing through various media platforms.

Table 2. Respondent Data Characteristics

Characteristics Hamlet	f	%	Characteristics Age Range	f	%
Turen	8	6,77	24-30 years old	17	14,40
Candi Dukuh	9	7,62	31-50 years old	78	66,10
Candi III	6	5,08	51-60 years old	21	17,79
Candi Karang	8	6,77	> 60 years old	2	1,69
Candiwinangun	11	9,32	**Highest Level of Education**		
Candi Rejo	7	5,93	Junior High School	3	11,01
Wonosobo	4	3,38	Senior High School	71	60,16
Rejosari	5	4,23	Diploma/ Bachelor's/ Master's/ Doctoral	34	28,81
Pencarsari	6	5,08	**Business Field**		
Blekik	7	5,93	Ready-to-eat food/ beverages	68	57,6
Prumpung	5	4,23	Packaged food/ beverages	44	37,2
Plumbon	4	3,38	Frozen Food	31	26,2
Ngebel Gede	3	2,54	**Business Duration**		
Dayakan	6	5,08	< 1 year	20	16,94
Jetis Baran	5	4,23	1-5 years	62	52,54
Bulusan	8	6,77			
Ngalangan	9	7,62			
Gondangan	7	5,93			

Research Instruments

The instruments used in this study include a knowledge test grid, a knowledge test administered via a Google Form (link: https://forms.gle/SjikmhXGAacxzyew5), and a training implementation plan (also referred to as a lesson plan). The knowledge test consists of 31 multiple-choice questions. The questionnaire used in this study was created independently by the author based on a literature review. The questions were created by developing operational verbs for each level of knowledge.

The levels of knowledge in this study are divided into two types, namely levels of expertise based on the taxonomy of knowledge domain by Benjamin S. Bloom (1956), i.e. remember (C1), understand (C2), and apply (C3), and levels of knowledge based on sub-variables of knowledge (factual, conceptual, procedural). A test blueprint is created to group questions used to measure specific knowledge level categories, such as C1, C2, C3, factual, conceptual, and procedural. Test scores are calculated using a nominal scale—score 1 for correct answers and 0 for incorrect answers. Validation of the test grid and knowledge test items was carried out with the help of experts (lecturers).

Table 3. Fish Processing Knowledge Test Grid

Variable	Sub Variable	Indicator	Sub Indicator	Knowledge Level			Num. Quest
				C1	C2	C3	
Knowledge	Factual Knowledge	Understanding of raw materials	Fish definition	1			1
			Fish classification	4, 7, 8	2, 3, 18	5, 6, 19	9
			Latin name for tilapia	9			1
			Types of tilapia	10			1
			Tilapia superiority			11	1
			Characteristics of fresh fish		17	20	2
		Knowledge of nutritional value	Nutritional components of fish	13, 15	14, 16	12	5
	Conceptual Knowledge	Food processing techniques	How to keep fish fresh		21, 22		2
			Selection of cut type		23		1
	Procedural Knowledge	Ability to make gyoza dan tilapia brownies	Making gyoza and brownies techniques			24, 25	2
			Gyoza and brownies innovation	28		26, 27	3
		Work safety knowledge	Safe usage of kitchen equipment	29			1
			First aid steps for kitchen accidents		30	31	2
	Total			10	10	11	31

Lesson plans are created to regulate the flow of activities from beginning to end (Table 4). Activities are divided into three parts: introduction, core activities, and conclusion. The initial plan for the activities is to be carried out over 180 minutes, with time allocation as stated in the lesson plan.

Table 4. Training Implementation Plan for Fish-Based Culinary Product Making

Core Activity	Description of activities	Time Allocation
Introduction	Greetings and opening activity	3 minutes
	Introduction	3 minutes
	Convey the core and objectives of the activity	5 minutes
	Pray	2 minutes
Main Activity	Explaining the training activity design starting from the pretest, providing material, practising making gyoza and tilapia brownies, and to the posttest.	5 minutes
	Doing a pretest on fishing processing knowledge	25 minutes
	Providing material on fish processing through a presentation (PPT) a. Fish definition b. Types of fish: Nutritional components of fish. How to process fish c. Benefits and importance of consuming fish d. Kitchen safety	35 minutes
	Allow respondents to ask a question	5 minutes
	Explaining the recipe and procedure for making gyoza and tilapia brownies	5 minutes
	Carrying out the practice of making gyoza and tilapia brownies	60 minutes
	Conducting a posttest on fish processing knowledge	25 minutes
Closing	Expressing gratitude and appreciation to the participants for their enthusiasm in participating in the training	5 minutes
	Closing the activity and saying goodbye	2 minutes

Validity dan Reliability

In this study, the validity and reliability of the instrument were measured using the SPSS application. The validity test was conducted on 30 people outside the research sample and calculated using the Pearson product-moment correlation. The validity test results show that there are six questions with a significance value < 0.361, which need to be improved. The six questions were enhanced so that they can afford the expected p-value.

The reliability test was conducted using SPSS with Cronbach's alpha formula. The results of the reliability test showed a Cronbach's alpha value of 0.880, which is greater than 0.6, indicating that the instrument, with 31 items, can be considered reliable. However, this study has a limitation: the validity and reliability tests were only conducted once on respondents outside the sample.

Data Analysis Techniques

After conducting pretests and posttests, the data were analysed using both descriptive and inferential statistical analyses. The descriptive statistical analyses used were the lowest value, the highest value, the mean, the median, and the mode. For inferential statistical analysis, we begin with a normality test using the Kolmogorov-Smirnov test, where the data is considered normally distributed if the significance level is greater than 0.05. Next, a paired sample t-test was conducted to determine if there was a significant difference between the pretest and posttest results. The condition for using a paired sample t-test is that the data must be normally distributed. If the paired sample t-test results in a 2-tailed significance value < 0.05, then there is a significant difference between the pretest and posttest results. Conversely, if the 2-tailed significance value is greater than 0.05, then it can be said that there is no significant difference between the pretest and posttest results.

After the paired sample t-test is performed, the N-gain test is then conducted to determine the improvement in learning outcomes or the change in scores between the pretest and posttest. N-gain provides an overview of the improvement that occurred from the initial condition (pretest) to the final condition (posttest) after the treatment was administered.

Table 5. N-Gain Range Category

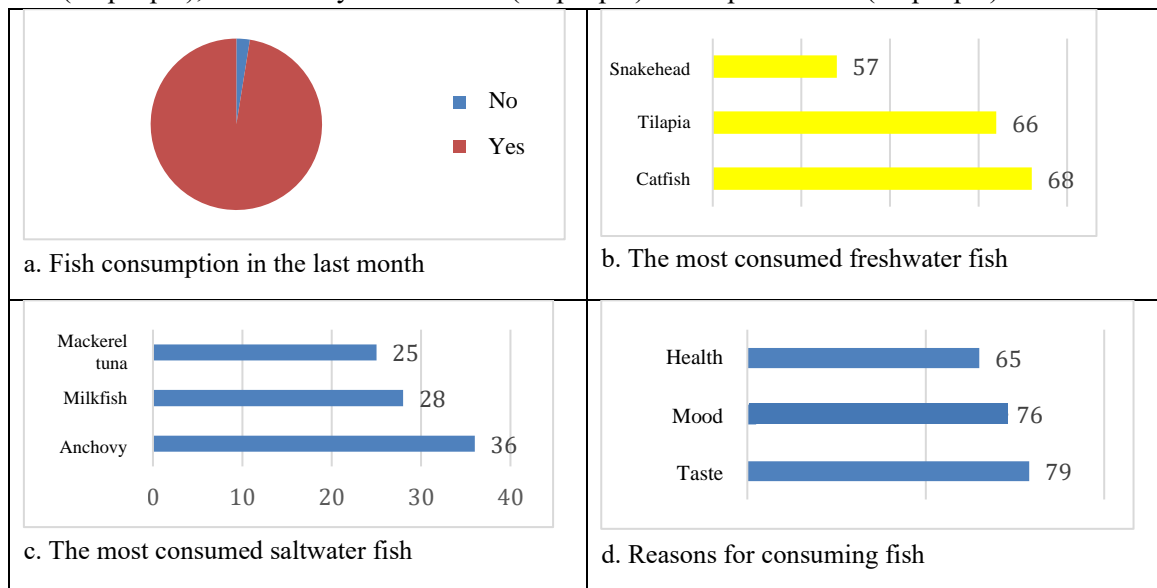| N-Gain Range	Category
N-Gain ≥ 0,7	High
0,3 ≤ N-Gain < 0,7	Medium
N-Gain < 0,3	Low

RESULT AND DISCUSSION

Result

1. Respondent Characteristics

More than half the population (60.16%) completed high school, 28.81% continued to diploma/S1/S2/S3, and the rest only graduated from junior high school (11.01%). The level of education is also a factor influencing the respondents' knowledge of fish processing. The respondents' business sectors are primarily centred on food and beverages. A total of 68 people (57.6%) have businesses in the ready-to-eat food/beverage sector, 44 people (37.2%) have firms in the packaged food/beverage sector, and 31 people (26.2%) have frozen food businesses. The majority of respondents have been in business for over 1 year. Monthly income also varies, but 56.77% of the population has an income between Rp2,000,000 and Rp5,000,000 per month.

2. Fish Consumption and Processing Patterns

The consumption patterns and fish processing methods of the respondents are illustrated in Figure 1. Most respondents regularly consume fish, with a frequency of 3-4 times per month (54.42%). The most consumed freshwater fish species are catfish (68 people), followed by tilapia (66 people), and snakehead (57 people). For saltwater fish, anchovies are the most frequently consumed species (36 people), followed by milkfish (28 people) and mackerel tuna (25 people). From this, it can be seen that respondents consume more freshwater fish than saltwater fish. This is likely due to the more affordable price of freshwater fish compared to saltwater fish. The reasons respondents consume fish are generally due to taste (sensory appeal) for 79 people, followed by emotional factors (mood) for 76 people, and health reasons for 65 people. The condition of the fish purchased is generally fresh (88 people) or whole, live, and frozen (85 people each). As for the most common places to buy fish, they are traditional markets (99 people), followed by fish markets (77 people) and supermarkets (67 people).

a. Fish consumption in the last month
b. The most consumed freshwater fish
c. The most consumed saltwater fish
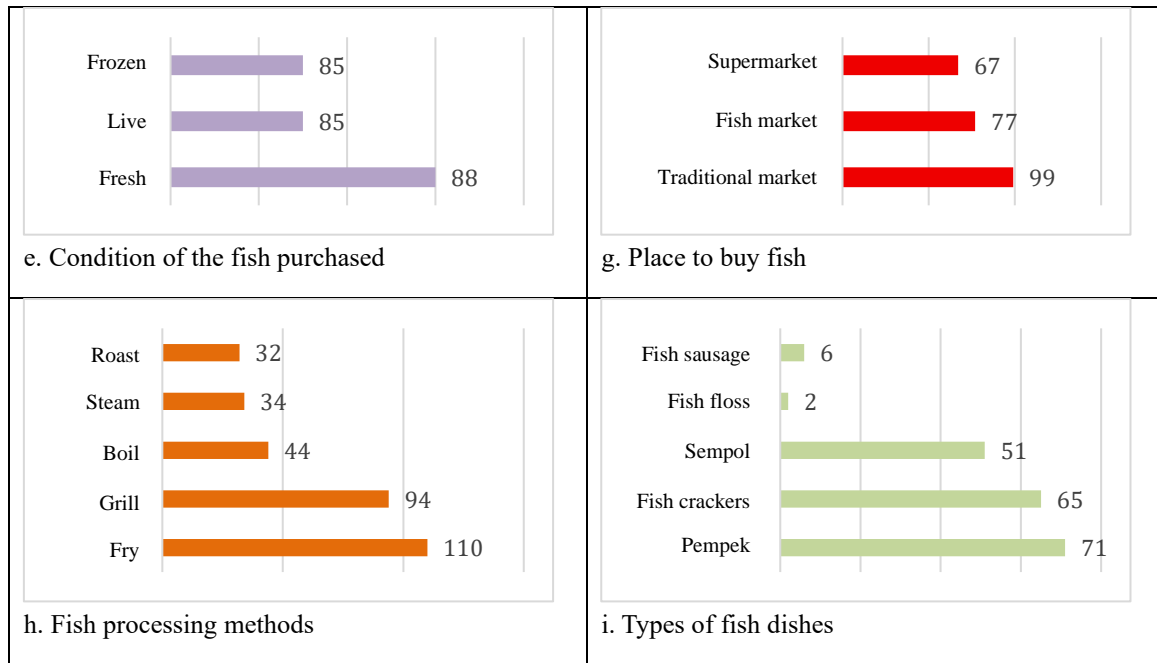d. Reasons for consuming fish

Figure 1. Respondent Data on Fish Consumption and Processing Patterns

The most popular method of fish processing is frying (110 people), followed by grilling (94 people), boiling (44 people), steaming (34 people), and roasting (32 people). This indicates a continued lack of variation in fish processing techniques used by the respondents. No respondents consumed raw fish. The most consumed types of processed fish products are *pempek* (71 people), fish crackers (65 people), and *sempol* (51 people). Meanwhile, products like fish floss and fish sausage are the least consumed. This is because respondents may not have found many fish floss or fish sausage products in their area, while products like *sempol*, fish crackers, and *pempek* can be found in many places.

3. Knowledge of Fish Processing Before Training

Based on the pretest results, the highest score obtained was 18 and the lowest score was 3, with an average of 10.38 and a standard deviation of 3.55. The frequency distribution of the respondents' pretest scores is presented in Table 6.

Table 6. Frequency Distribution of Pretest Scores for Respondents

Score	Frequency	Percentage (%)
3 – 4	7	5,93
5 – 6	9	7,63
7 – 8	24	20,34
9 – 10	19	16,10
11 – 12	24	20,34
13 – 14	19	16,10
15 – 16	12	10,17
17 – 18	4	3,39
Total	118	100

Based on knowledge level categories, the majority of respondents have moderate knowledge, regardless of whether it's based on C1, C2, or C3 knowledge levels or on the sub-variables of factual, conceptual, and procedural knowledge. 14% of respondents are in the low category, 64% of respondents are in the medium category, and 22% of respondents are in the high category.
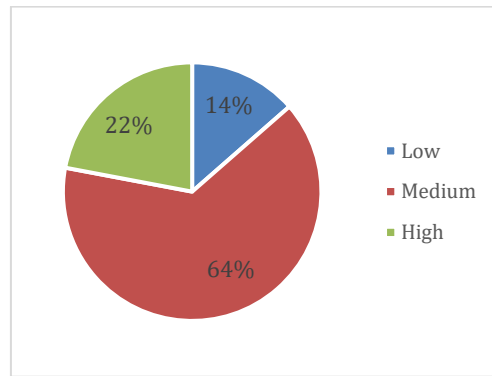
Figure 2. Graph of Knowledge Level Categories for Women Entrepreneurs Before Training

The level of knowledge among women entrepreneurs in Sardonoharjo Village was measured prior to the training being conducted. The percentage of knowledge levels is presented in Table 7.

Table 7. Knowledge Level Category of Women Entrepreneurs Before Training

Knowledge Level	f	%	Knowledge Level	f	%
C1	85	72,03	Factual	82	69,49
C2	78	66,10	Conceptual	61	51,69
C3	80	67,80	Procedural	86	72,88

4. Implementation of Fish Processing Training

The training on fish-based culinary product making was conducted using lecture and practical methods. The lecture was delivered with the help of PowerPoint media. After the material presentation was finished, the activity continued with the practical creation of fish-based culinary products, namely gyoza and tilapia fish brownies. The activity proceeded according to the flow outlined in the lesson plan. During the implementation, the participants were enthusiastic about asking questions and trying to make the product.

Figure 3. Implementation of Fish Processing Training

The training implementation was structured using a Training Implementation Plan (TIP) to ensure it runs systematically and effectively [10]. The training materials include an introduction to fish nutrition, processing methods, and practical exercises in making tilapia-based gyoza and brownies. The entire training program proceeded according to plan, despite some adjustments in timing due to the high enthusiasm of the participants and technical constraints in the field. The use of PowerPoint media and

the lecture method is effective in delivering material [11]. The enthusiasm of the respondents was evident during the practice, especially when they formed small groups for collaboration, which proved capable of increasing participant engagement [12]. The direct practice method (learning by doing) has proven effective in improving procedural skills, especially for MSME actors with non-formal education [13].

5. Fish Processing Knowledge After Training

After the training, the posttest scores showed an increase. The highest score was 30 and the lowest was 17, with an average of 22.71 and a standard deviation of 3.06. The distribution of posttest scores is shown in Table 8.

Table 8. Frequency Distribution of Posttest Scores for Respondents

Score	Frequency	Percentage (%)
17-18	10	8,47
19-20	25	21,19
21-22	21	17,80
23-24	25	21,19
25-26	25	21,19
27-28	8	6,78
29-30	4	3,39
Total	118	100

Most respondents remained in the moderate category (72.03%), but the proportion in the high category increased to 23 people (19.49%), while the proportion in the low category decreased to 10 people (8.47%).
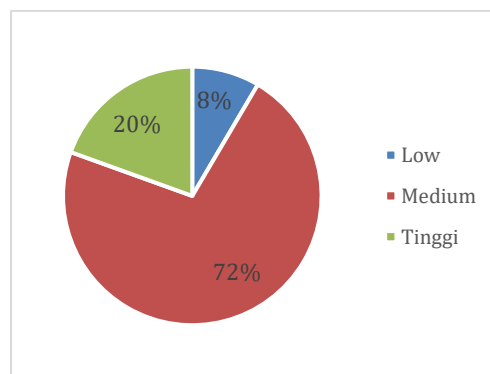

Figure 4. Graph of Knowledge Level Category of Women Entrepreneurs After Training

Table 9 shows that an increase in knowledge is also evident at each level of expertise. For example, for C2 (understanding), the proportion of respondents in the high category increased from 8.47% to 33.90%. For C3 (applying), the high category risen from 20.34% to 18.64%.

Table 9. Knowledge Level Category of Women Entrepreneurs After Training

Knowledge Level	f	%	Knowledge Level	f	%
C1	78	66,10	Factual	80	67,80
C2	54	45,76	Conceptual	110	93,22
C3	83	70,34	Procedural	83	70,34

After the training, there was an increase in knowledge among most respondents, particularly in factual and procedural aspects. Although the majority of respondents remained in the moderate category, the increase in pretest and posttest scores indicates a positive impact from the training. This

aligns with the findings of Miyanto (2021), who confirmed that systematic training increases participants' factual knowledge [14]. Respondents were able to recall basic material, understand sanitation principles, and demonstrate the ability to apply knowledge practically during training. This aligns with the research findings by Erviana et al. (2021), which explain that practice-based training can strengthen participants' memory and understanding of the training material, especially at a basic cognitive level, such as the C1 knowledge level [15]. The significant improvement in the procedural aspect is supported by Pratama (2021), who states that active participant involvement in practice is an indicator of training success [16].

However, the increase in conceptual knowledge is still limited. As explained by McCormick (1997) and Miyanto (2021), conceptual knowledge requires an in-depth approach and more time to master truly, especially for participants from non-formal backgrounds [14], [17]. Therefore, interactive training that prioritises direct discussion and question-and-answer sessions, as stated by Khairina et al. (2020), is essential to strengthen participants' conceptual understanding [18].

6. Changes in Knowledge Before and After Training

The results of the normality test, using the Kolmogorov-Smirnov test, showed that the data were normally distributed ($p = 0.716 > 0.05$); therefore, the analysis continued using a paired sample t-test. The results of the paired sample t-test showed a significant difference between pretest and posttest scores ($p < 0.05$), as shown in Figure 5.
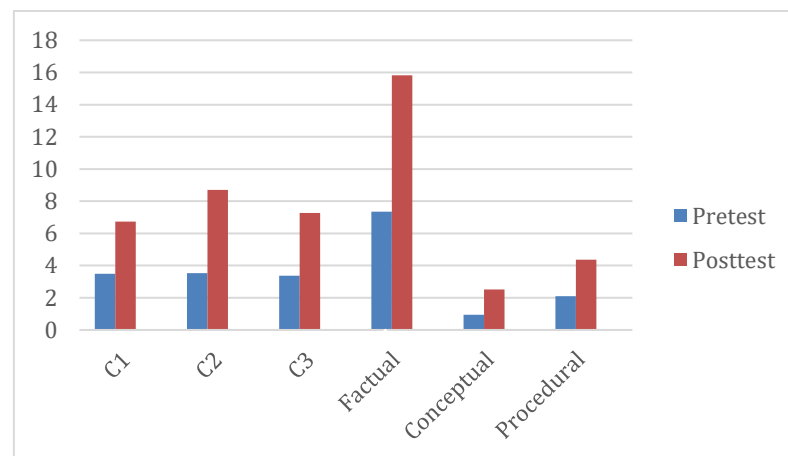

Figure 5. Graph of Knowledge Change in Women Entrepreneurs Before and After Training

To determine the magnitude of the increase, an N-gain calculation was performed. The overall N-gain value was 0.63, which falls into the moderate category. No respondents experienced an increase in the low category. This indicates that the training successfully and significantly increased the knowledge of women entrepreneurs in micro, small, and medium-sized enterprises (MSMEs). The N-gain results are presented in Table 10.

Table 10. Knowledge Improvement Category Based on N-gain Score

N-Gain Score	Category	Frequency	Percentage (%)
≥ 0,7	High	38	32,20
0,3 – < 0,7	Medium	80	67,80
< 0,3	Low	0	0,00

Discussion

Based on Table 6. Generally, the respondents' knowledge level before training was in the moderate category, with 76 people (64.41%) falling into this category. Sixteen individuals fell into the low category, and 26 individuals fell into the high category. This indicates that the respondents are familiar with the fundamental theories and materials related to fish processing, as well as their concepts and applications in daily life. Basic fish processing materials include the definition of fish, the classification of fish species, and their benefits to humans. Fish processing concepts, for example, encompass fish handling methods, including cleaning and storage.

Based on Figure 2, the majority of respondents have moderate knowledge. One of the key factors influencing the results is the use of social media as a source of information for respondents. In the context of the times, access to information through social media is also a factor that influences the level of public knowledge. Based on research by Femyliati et al. (2023), an increase in a person's knowledge can be triggered by receiving information through infographics during an intervention, as the data obtained can be processed directly by the brain [19]. However, according to Sari (2021), although social media provides ease in obtaining information, this information is often not systematically organised, and not all of it is valid [13]. Therefore, although the respondents are quite active in using social media, their understanding of fish processing still requires strengthening through structured training.

Before the training was conducted, the knowledge level of the women entrepreneurs in Sardonoharjo Village was mainly in the moderate category, as indicated by the knowledge levels C1, C2, and C3, as well as the sub-variables of factual, conceptual, and procedural knowledge. This suggests that the respondents already possess a basic understanding of fish processing, including recognising different types of fish and how to clean and store them. Still, they have not yet mastered diverse and innovative processing methods. The limited knowledge of technique variations is evident from the respondents' tendency to choose frying as a processing method and their low comfort level in processing fish, which is a reason for consuming fish. This situation highlights the importance of training to enhance skills and creativity in fish processing, which aligns with the finding (Dewi et al., 2018) that mothers' knowledge is closely related to the provision of nutritious food [20]. Additionally, training has been proven to significantly impact the capacity building of MSME actors, as stated by Miyanto (2021) and Erviana et al. (2021), particularly in terms of skills and technical understanding of processing [14], [15].

The results of the T-test and N-Gain analysis show that, although the respondents' knowledge categories largely remained at a moderate level, there was a significant increase in their knowledge scores. The frequency of knowledge changes indicates that a small portion of respondents experienced an increase or decrease in their category, but the majority remained stable. This is influenced by the moderate difficulty level of the questions, which tends to result in a clustered distribution of scores [21]. The most significant increase occurred in the procedural sub-variable, which is consistent with the characteristics of practice-based training. Learning by doing is more effective in improving procedural skills, especially for MSME actors with non-formal educational backgrounds [22].

The results of the fish processing training indicate that, although the training had a positive impact, many respondents still require additional time and opportunities to achieve a deeper level of understanding. This aligns with research conducted by Kusnadi (2019), which revealed that systematically implemented practice-based training can indeed increase respondents' knowledge, particularly in the fisheries MSME sector. However, respondents may sometimes require more time to master conceptual material. [23]. Despite this, efforts have already been made in fish processing training to optimise the enhancement of conceptual knowledge through direct discussion and question-and-answer sessions. This statement is supported by Khairina et al. (2020), who stated that interactive methods are essential in delivering conceptual material, as direct discussion and question-and-answer sessions can strengthen respondents' understanding of basic concepts [18]. Thus, this training is considered to have made a significant contribution to improving fish processing knowledge. However, follow-up is necessary to develop the conceptual aspects further and achieve more optimal results.

CONCLUSION

Based on the research conducted, it was concluded that the level of knowledge about fish processing among women entrepreneurs in Sardonoharjo Village before participating in the training fell into the moderate category, with a pretest average score of 10.38. The lowest average scores were observed in the C3 and the conceptual aspects. The implementation of the fish-based culinary product-making training in Sardonoharjo Village was conducted using a lecture method that included theoretical presentations and hands-on practice. This training offers participants new insights into fish processing techniques and the benefits of consuming fish. The level of knowledge among women entrepreneurs in Sardonoharjo Village regarding fish processing after training was mainly in the moderate category, with a post-test mean score of 22.71. The highest knowledge improvement was observed in the C2 and conceptual aspects. From the results of the statistical test using the paired sample t-test, it can be seen that there was a significant change in the knowledge of the mothers who are SME entrepreneurs in Sardonoharjo Village regarding fish processing before and after the training. According to the N-gain test results, the improvement is moderate, with a score of 0.63. Therefore, it can be concluded that although there was no increase in the knowledge level category, there was still an increase in fish processing knowledge among the women entrepreneurs in Sardonoharjo Village.

The limitations in this study can be improved in several ways, such as adjusting the proportion of training between theory and practice, for example, 40% theory and 60% practice, to make it easier for respondents to understand the basic principles of fish processing. Continuous training and post-training mentoring should also be provided to ensure that the knowledge imparted can be applied sustainably in the respondents' business practices. Additionally, the government or relevant parties can facilitate respondents' access to production inputs such as quality raw materials and production tools. Further research can also be conducted to evaluate the long-term impact of the training and identify other factors influencing the successful improvement of fish processing knowledge among MSMEs.

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